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A novel approach to clinical simulation in removable partial denture treatment

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1 | PROBLEM

Dental students are required to complete at least 1 removable partial denture (RPD) prosthesis prior to graduation. The interruption of clinical activities due to the COVID-19 pandemic impaired some students from completing certain clinical requirements. Although temporary modifications were made following CODA recommendations, 3 students still required clearance to return to school to complete the patient-based RPD requirement.

2 | SOLUTION

Since elective patient care was not an option, a non-aerosol-producing simulation clinic alternate activity was designed and implemented in 2 stages:

1. Online Exercise: Students were required to complete preassigned online modules. Each module was carefully designed to consist of pertinent scientific articles, instructional videos, and PowerPoint presentations related to the delivery and maintenance of an RPD. Student formative assessment was done at the completion of each module with a short questionnaire, which was a combination of multiple choice and essay questions. Completion of the entire exercise was a prerequisite to proceed to stage 2.
2. Simulated Removable Prosthodontics Clinic Case: Pre-prepared, partially edentulous (Kennedy Class II, modification 1) maxillary and mandibular Frasaco AN-4 typodonts (Greenville, NC, USA) were scanned using an intraoral scanner (Trios 3; 3Shape, Copenhagen, Denmark). For each arch, a 1-piece RPD (framework, denture base, denture teeth) was designed (3Shape Dental Systems RPD module; 3Shape, Copenhagen, Denmark) and 3D-printed (Form2; FormLabs Inc., Boston, MA, USA) in gray resin (FormLabs Inc., Boston, MA) to simulate a laboratory processed RPD (Figures 1-4). The 1-piece RPD included the following features: overextended flanges, hyperocclusion, and pressure areas in the intaglio surface of the denture base. Each student set up a simulated clinical environment in the assigned clinic, following standard infection control guidelines and PPE use. The typodont was mounted to a manikin head and shroud. Students were required to successfully deliver the 3D-printed maxillary and mandibular RPDs. Students were assessed on their ability to recognize and perform necessary adjustments to ensure successful delivery of an RPD. Infection control and patient management competencies were tailored accordingly to the simulation, but no other changes were made to the grading rubrics associated with the RPD competency exercise.

Examination integrity was ensured with an honor code statement, browser lockdown, and faculty supervision throughout the entire simulation exercise.

3 | RESULTS

The RPD requirement was presented and evaluated through an alternative education activity to the students who were unable to complete the delivery of the prosthesis on a patient. In an attempt to provide the affected

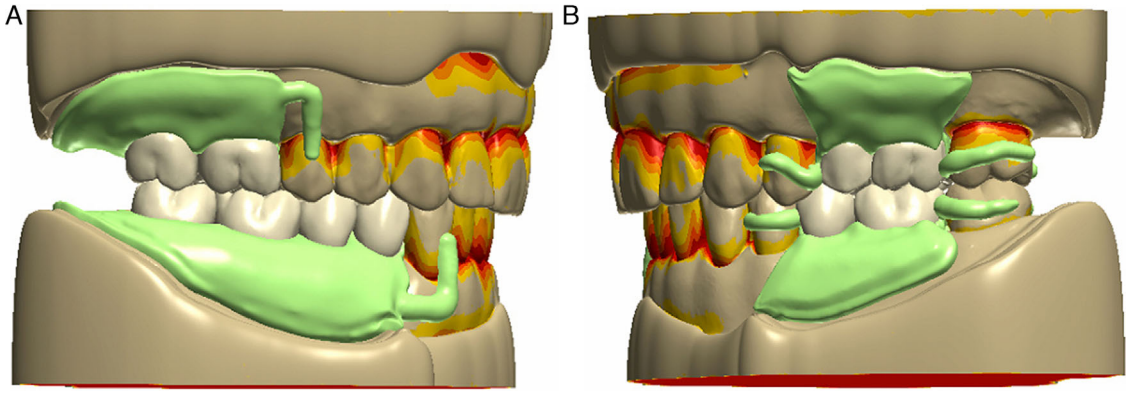

FIGURE 1 Screenshots during one-piece RPD digital design

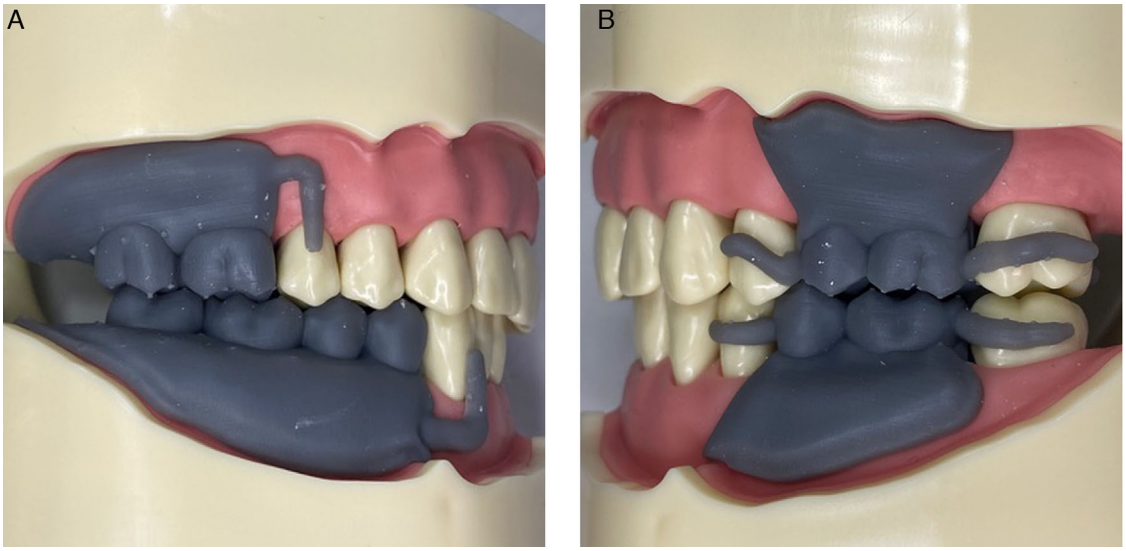

FIGURE 2 3D printed models, lateral view

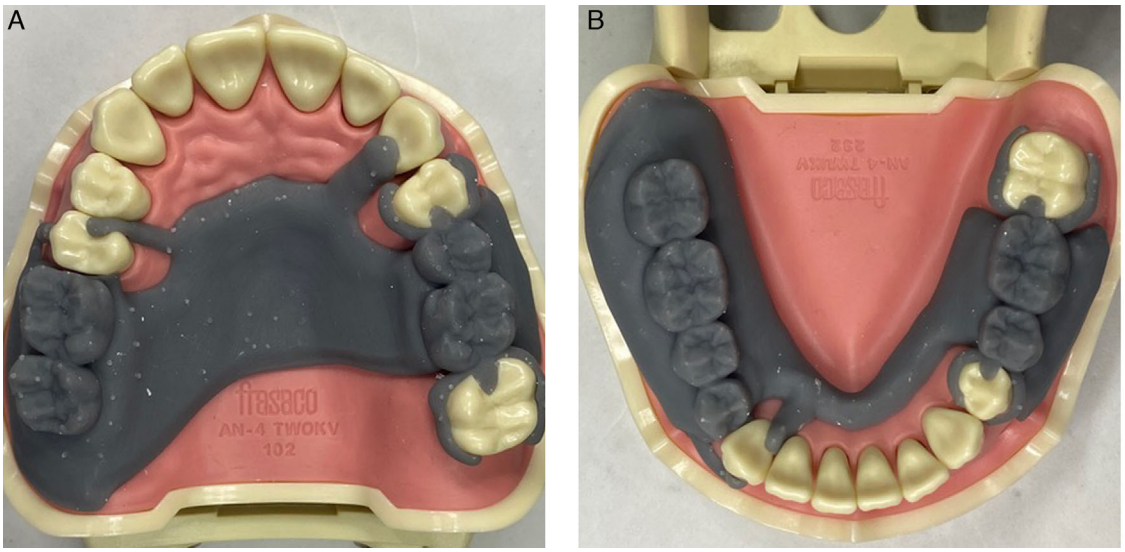

FIGURE 3 3D printed models, occlusal view

FIGURE 4 Close up of occlusal rest fully seated in rest seat preparation

students with a meaningful learning experience, maxillary and mandibular 3D-printed models were used to simulate the delivery of an RPD.[1] Students' feedback was overwhelmingly positive. The exercise allowed them to improve and reinforce their critical thinking and hands-on skills.[2] Although the clinical exercise was meant to emulate the delivery of a laboratory-processed RPD, the brittleness of the material used to print the 3D model did not allow the students to perform other clinical procedures, such as clasp adjustment. Differences in materials' properties (framework alloy vs. 3D printing resin) and clasp adjustment techniques were briefly discussed prior starting the activity. Also, the students missed the patient interaction that occurs during delivery since the procedure was done on a manikin. Overall, the exercise outcome was satisfactory and with some improvements could be considered in the future as a novel method to assess preclinical learning.

CONFLICT OF INTEREST

None.

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